Weather Technology in the Cockpit (WTIC) Program General Aviation Research Activities

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WTIC Mission Statement

- Successfully accomplish research projects to develop, verify, and validate requirements to support airworthiness standards for enabling availability and improving the quality and quantity of meteorological (MET) information available to the aircraft for the support of NextGen operational improvements

Research projects in the WTIC portfolio must support the mission statement

Why WTIC?

- Lack of standardized MET information leads to:
  - Safety concerns
  - Lack of common situational awareness
  - WTIC support critical to MET / AIS symbology development (SAE G10)

Differing color legends on two METARs displays

Why WTIC?

NTSB

SAFETY ALERT

National Transportation Safety Board

★ Thunderstorm Encounters

IFR pilots need to actively maintain awareness of severe weather along their route of flight

The problem

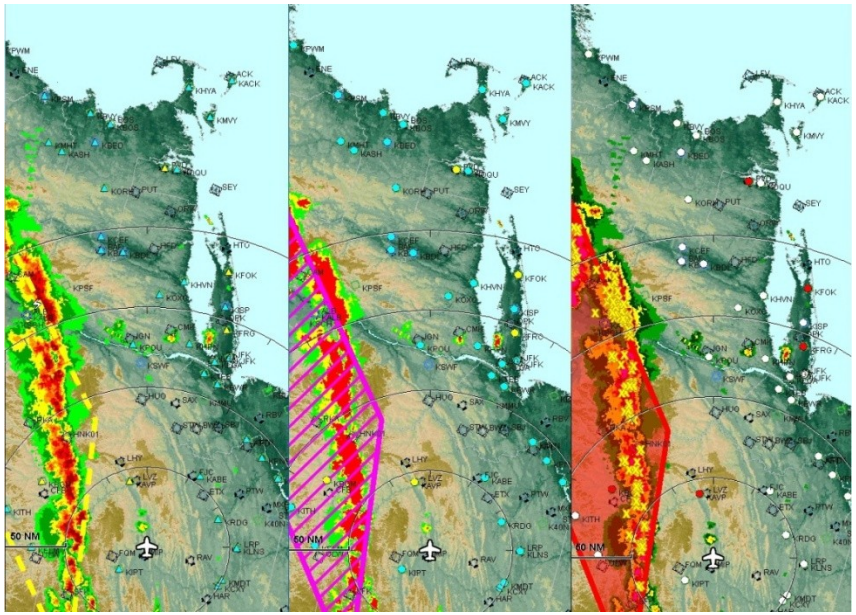
- Recent NTSB investigations have identified several accidents that appear to be wholly or partly attributable to in-flight encounters with severe weather.
- These accidents have all involved aircraft operating under instrument flight rules and in contact with air traffic controllers.
- Investigations show that pilots were either not advised about areas of severe weather ahead or were given incomplete information.
- Each pilot had readily available alternatives that, if utilized, would have likely prevented the accident.
- ATC training and briefings to controllers have not been sufficient to ensure that pilots receive the weather advisories needed to support good in-flight weather avoidance decisions.
- Recent examples:

Verbalizing a ground MET display to a pilot is subject to error!

Current WTIC GA Research

Standardization Demo

- Purpose: evaluate current industry-standard Meteorological (MET) presentations to assess the impact of non-standard weather presentation on General Aviation (GA) pilot decision-making and weather data interpretation.



WTIC Human Factors Considerations

- Human Factors Issues*
  - No standard presentation for MET information
  - Content differs between products/vendors
  - Pilots must spend time interpreting information
  - Rendering of MET information may be inadequate to support pilot decision making relative to adverse weather
  - Limited MET product training offered by vendors
- MET information utilized in the cockpit and on the ground does not consistently enhance common situational awareness

WTIC GA Research Activities

Project	Description and Primary Deliverables	Application
User Needs Statement from a GA Perspectives	Study on GA user needs, key elements for a GA WTIC ConOps, and review of MET guidance and training materials: Final report delivered	Data to update MET sections in ACs and training guidance
HF Standardization Assessment – Tech Center HF Lab	Quantitatively assess the impact the lack of GA MET presentation standardization in the cockpit has on pilot decision making: Final report due 6/12	Prioritization of MET presentation standardization efforts for SAE G10 and WTIC
Incident Assessment via Aviation Safety Reporting System (ASRS) Database – NASA	Perform detailed CALLBACKS on 100 ASRS incident reports (part 91 and 121) Final report delivered	Identifies to AVS current MET issues/concerns
SAE G-10 MET Symbology Activity	Collect MET information required by phases of flight: Symbology verification plan and users survey/Human-in-the-Loop	Published Guidance for standardized MET symbology in SAE Aerospace Recommended Practice(ARP) 5740
GA Concept of Operations	Align and update WTIC ConOps with NextGen portfolios for Part 91, 121 and 135 operations	Update WTIC ConOps

Potential GA Research Activities

Research	Description
Decision Making	Develop rule sets (including a hierarchy of cockpit MET sources) for weather avoidance decision-making and perform Human in the Loop (HITL) evaluations of impacts (GA perspective) Develop guidance to enhance use of forecasting products for pilot decision making Identify key forecast elements needed for pilot decision making (per pilot type if needed)
Error Management	Research and identify common mode errors associated with current weather information systems and recommend mitigation strategies to facility quick recovery. Develop guidelines to identify and mitigate pilot errors related to weather information usage.
MET Mobile Devices	Research user needs in Air Route Traffic Control Center (ARTCC) and aircraft for MET information presented on mobile devices.
Regulatory	Research and identify all FAA regulations and policies pertaining to weather and identify those that may be impacted by NextGen concepts for WTIC
Runway updates	Research methodology (technology, message content, etc.) and feasibility of aircraft updating landing conditions to next aircraft in adverse conditions

Back-up Slide

Overall Safety Drivers

- Examples of Product Human Factors Issues*
  - Color

Weather product	XM	WSI	WxWorx
Wind	green	blue	Color legend
AIRMET sierra (IFR)	purple	red	green
AIRMET tango (Turbulence)	orange	green and yellow	orange
AIRMET Zulu (icing)	blue	blue	blue
SIGMET	yellow	magenta	red
METAR	VFR: cyan	VFR: cyan	VFR: white
	MVFR: green	MVFR: green	MVFR: blue
	IFR: yellow	IFR: yellow	IFR: red
	LFR: red	LFR: red	LFR: purple